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(54) IMPROVEMENTS RELATING TO METAL SEALS OR GASKETS

(71) I, TERENCE PETER NICHOLSON, a British Subject of, Calf Hall, Muggleswick, Derwentside, Co. Durham, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to annular metal seals, — hereinafter referred to as gaskets, — for making fluid tight sealed joints between opposed parallel surfaces. Examples of such surfaces are pipe flanges, valve covers and so forth where it is virtually necessary to fit the gasket into a recess machined into one or each of the surfaces or alternatively to use in addition a compression control ring.

A desirable attribute of such a gasket is that it should have a degree of resilience such that when released from a predetermined compressive force it returns to a considerable extent towards its original dimension. Unfortunately however this resilience tends to reduce the surface pressure or compressive load on the upper and lower surfaces of the gasket to the extent that it becomes insufficient to cause deformation of the gasket into surface irregularities of the opposed surfaces especially when these have very rough machine finishes.

The present invention has been devised with the general object of providing a compressible yet resilient metal gasket which can satisfactorily be used to form a fluid tight joint between opposed surfaces having irregularities therein. A subsidiary object is to provide a satisfactory alternative to known spirally wound gaskets which cause both indentation and corrosion of faces which they seal, and also an alternative to larger diameter metal "O" rings.

Thus in accordance with the invention there is provided an annular metal gasket, for making a fluid-tight sealed joint between opposed parallel surfaces, having a radially inner face and a radially outer face formed with a peripheral groove, and in which at least one of a pair of parallel end faces intended respectively to engage said opposed parallel surfaces is formed with concentric annular grooves which have a rectangular profile in a radial plane.

Additionally, and particularly when the radial dimension of the gasket is relatively large in comparison with the gasket thickness, it may be formed with one or more annular cavities which open into one or other of the grooved ends of the gasket.

Examples of gaskets constructed according to the invention are illustrated in the drawings accompanying our Provisional Specification, in which:—

Figure 1 is a cross-sectional view of one form of gasket;

Figure 2 shows the gasket of Figure 1 housed in a recess in one of a pair of flanges which are to be drawn together to form a fluid-tight seal;

Figure 3 shows the mode of use of the gasket of Figure 1 with a nip control ring;

Figure 4 is a cross-section of another form of gasket; and

Figure 5 is a general view of a third form of gasket intended for use in a heat exchanger.

Referring now to Figure 1 the annular gasket there shown is mainly intended for use in the sealing of joints between flanges defining relatively small bores. It is of circular annular shape and may be said to comprise a central somewhat resilient solid body part E K F H L G shown cross-hatched and of which the machined parts GLH and EKF respectively constitute radially inner and radially outer grooves.

The upper body part AEBG and the lower body part FCDH are each formed with a series of annular end face grooves I and J of rectangular profile. The effect of these grooves is that the compressive load is concentrated into less than 50% of the total seal surface area and this has the result that when a compressive load is applied the parts

of the gasket which separate the grooves can flow into irregularities of the opposed surfaces to be sealed in order to ensure a perfect seal. It is to be understood that these grooves in the sealing surfaces can be formed by machining or etching. Typical modes of installation of the Figure 1 gasket are shown in Figures 2 and 3, the surrounding ring S in Figure 3 being a nip control ring.

It is generally accepted that increases in bore size in a member should be matched by increases in the radial width of a flange or other part surrounding the bore and this applies also to a sealing gasket intended to be interposed between two such members. Moreover when high pressures are likely to be developed in such a bore a still further increased radial width is usually required. However if the radial width of a gasket such as has been described with reference to Figures 1 to 3 is increased substantially it loses its resilience.

For such applications therefore, the gasket is modified somewhat as indicated in Figure 4. This embodiment may be regarded as an aggregation of two or more concentric rings as shown in Figure 1 such as to provide a plurality of annular cavities T which open into one or other of the gasket end faces between groups of rectangular profile annular grooves therein.

Although annular gaskets or seals according to the invention will most usually have the shape of a circular ring and have a circular central aperture it is to be understood that they may be otherwise shaped to suit more than one such aperture of circular, oval, triangular, rectangular or other closed shape. Although circular seals could be machined from solid material, it is much more economical if they are fabricated from solid drawn or rolled material of the correct section and the ends either butt welded or brazed together. A variety of materials may be used and selected to suit any particular condition.

The gaskets have a particular suitability for use with single or multiple aperture heat exchangers. Figure 5 is an end view of a typical heat exchanger gasket constructed as above described with reference to Figures 1 and 2 but with the addition of welded or brazed-on cross-bars W for reinforcement purposes. The gasket can be plated — generally by electro-deposition — with metal such as silver, indium, gold, nickel, and so forth.

Gaskets as described may be said to function not only as a pressure seal but also as a labyrinth seal. Thus if for some reason there were a deep depression across one of the two surfaces which the interposed gasket had not quite filled there would be a pressure drop across each of its face grooves resulting in a leak tight seal.

WHAT I CLAIM IS:—

1. An annular metal gasket for making a fluid-tight sealed joint between opposed parallel surfaces, having a radially inner face and a radially outer face each formed with a peripheral groove, and in which at least one of a pair of parallel end faces intended respectively to engage said opposed parallel surfaces is formed with concentric annular grooves which have a rectangular profile in a radial plane.

2. A metal gasket as claimed in claim 1 and which is formed internally with one or more annular cavities which open into one or other of the grooved ends of the gasket.

3. A metal gasket as claimed in claim 2 in which the or each cavity has, in the radial cross-section of the gasket, a T-shaped profile.

4. A metal gasket as claimed in any of claims 1 to 3 having cross bars secured thereto for reinforcement purposes.

5. A metal gasket substantially as hereinbefore described with reference to and as shown in any of Figures 1 to 5 of the drawings accompanying the Provisional Specification.

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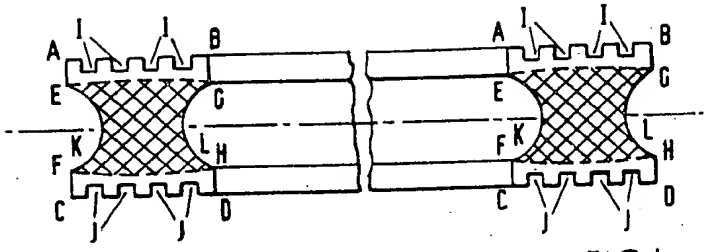

FIG. 1.

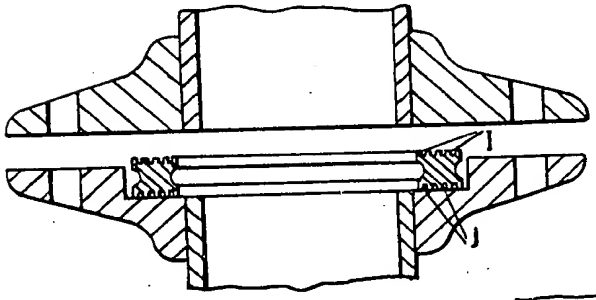

FIG. 2.

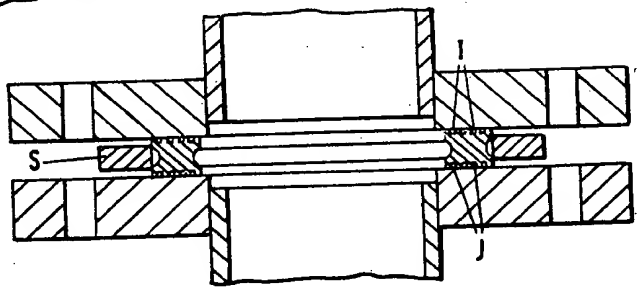

FIG. 3.

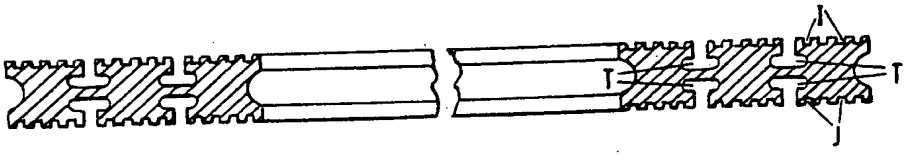

FIG 4

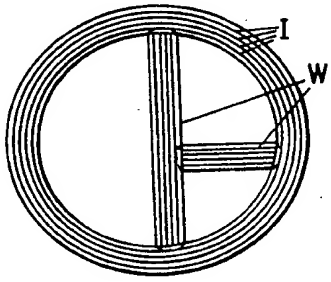

FIG. 5.